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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/727,451

12/03/2003

Peter J. Hopper

100-18010 (P05268-D01)

7097

33402

7590

01/23/2006

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EXAMINER

NGUYEN, HA T

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 01/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/727,451

Applicant(s)

HOPPER ET AL.

Examiner

Ha T. Nguyen

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 47-64 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 47-64 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 November 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11-1-5</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 7-27-5 has been entered and made of record .

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(a) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 47 and 49-50 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (USPN 5741741).

Referring to Figs. 2-10 and related text, Tseng discloses[Re claims 47 and 50] a method of forming a semiconductor device, the method comprising: forming a layer of insulation material 16 over a semiconductor structure 10 (see col. 1, lines 6-12), the layer of insulation material having a top surface; performing a first etch of a first region of the top surface of the layer of insulation material without etching a second region of the top surface of the layer of insulation material, the first etch forming a plurality of openings 13 in the layer of insulation material, the plurality of openings having depths and bottom surfaces (see Fig. 3); and

simultaneously performing a second etch of the second region of the top surface of the layer of insulation material and the bottom surface of each opening, the second etch substantially increasing the depths of the openings to form a plurality of trenches (see Fig. 7); [Re claim 49] wherein the plurality of trenches lie substantially parallel to each other.

But it fails to disclose expressly each trench or opening having a bottom surface with a length that is significantly greater than a width. However any variation in dimension of the trench bottom surface in the present claims is obvious in light of the cited art, because the changes in dimension produce no unexpected function. *The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the art. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. In re Aller, Lacey and Hall, 105 U.S.P.Q. 233, 235. In re Reese 129 U.S.P.Q. 402, 406.*

4. Claims 48, 51, 53, 55-56, and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng, as applied above, and further in view of Chittipeddi et al. (USPN 6417087, hereinafter "Chittipeddi").

Tseng discloses substantially the limitations of claims 48, 51, 53, 55-56, and 62, as shown above. Tseng discloses forming a conductive layer on the layer of insulation material, the conductive layer filling up the trenches; and planarizing the conductive layer (see Figs. 9-10).

But it fails to disclose expressly [Re claims 51 and 62] forming a single conductive region, the single conductive region in the trenches forming a plurality of fingers, each finger having a bottom surface with a length that is significantly greater than a width; [Re claims 48 and 53] wherein the bottom surface of each of a number of fingers (trenches) contact a same conductive structure; [Re claim 55] wherein the conductive structure is a top surface of a via; [Re claim 56] wherein the conductive structure is a top surface of a contact;

However, the missing limitations are well known in the art because Chittipeddi discloses these features (See Fig. 2). The arguments concerning the dimensions in claim 47 also apply. Besides, it would have been obvious to have connection made to the top surface of a via if connection is to be done to only a portion of a lower level conductor. A person of ordinary skill is motivated to modify Tseng with Chittipeddi to reduce stress.

Therefore, it would have been obvious to combine Tseng with Chittipeddi to obtain the invention as specified in claims 48, 51, 53, 55-56, and 62.

5. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng in view of Chittipeddi, as applied above, and further in view of Adams et al. (USPN 6566242, hereinafter "Adams").

The combined teaching of Tseng and Chittipeddi discloses substantially the limitations of claim 52, as shown above. It also discloses wherein the layer of conductive material includes a barrier layer formed on the layer of insulation material; and a layer of copper formed on the layer of barrier material (see Tseng, col. 7, lines 37-47).

But it fails to disclose expressly a layer of seed material being formed on the layer of barrier material.

However, the missing limitation is well known in the art because Adams discloses this feature (See col. 9, lines 58-65).

A person of ordinary skill is motivated to modify Tseng and Chittipeddi with Adams to form reliable Cu interconnect at a low cost.

Therefore, it would have been obvious to combine Tseng and Chittipeddi with Adams to obtain the invention as specified in claim 52 .

6. Claims 54 and 63-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng in view of Chittipedi, as applied above, and further in view of Yu et al. (USPN 5952704).

The combined teaching of Tseng and Chittipedi discloses substantially the limitations of claims 54 and 63-64, as shown above.

But it does not disclose expressly wherein the conductive region is formed to have a number of loops; wherein the loops lie substantially in a same plane; the loops being electrically connected together.

However, the missing limitations are well known in the art because Yu discloses these features (See Figs. 1-5).

A person of ordinary skill is motivated to modify Tseng and Chittipedi with Yu to obtain an inductive wiring with reduce parasitic capacitance (see Yu, abstract).

Art Unit: 2812

Therefore, at the time the invention was made, it would have been obvious to combine Tseng and Chittipedi with Yu to obtain the invention as specified in claims 54 and 63-64.

7. Claim 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng in view of Inohara et al. (USPN 5976972, hereinafter "Inohara").

Tseng discloses substantially the limitations of claims 57-58, as shown above.

But it does not disclose expressly [Re claim 57] wherein the bottom surface of a trench exposes an area of a conductive structure and an area of the insulation material, the area of the insulation material being substantially greater than the area of the conductive structure; [Re claim 58] wherein the bottom surface of each opening has a length that is significantly greater than a width.

However, the missing limitations are well known in the art because Inohara discloses wherein the bottom surface exposes these features (see Fig. 9A-9B). The examiner interpreted that depending on the size of the contact hole more or less of the insulation material would be exposed. The arguments concerning the dimensions in claim 47 also apply.

A person of ordinary skill is motivated to modify Tseng with Inohara to make connections of desired size at desired locations.

Therefore, at the time the invention was made, it would have been obvious to combine Tseng with Inohara to obtain the invention as specified in claims 57-58.

8. Claims 59-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng in view of Inohara, as applied above, and further in view of Chittipedi.

[Re claim 59] The combined teaching of Tseng and Inohara discloses substantially the limitations of claim 59, as shown above. But it does not disclose expressly the details about the conductive layer. However, the missing limitations are well known in the art, as shown in the rejection of claim 51.

[Re claim 60] Chittipedi discloses wherein the bottom surface of each of a number of fingers contact a same conductive structure, as shown above.

Art Unit: 2812

9. Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng in view of Inohara and Chittipeddi, as applied above, and further in view of Yu.

The combined teaching of Tseng, Inohara and Chittipeddi discloses substantially the limitations of claim 61, as shown above.

But it does not disclose expressly wherein the single conductive region is formed to have a number of loops that lie substantially in a same plane.

However, the missing limitations are well known in the art, as shown in the rejection of claim 54.

Response to Amendment

10. In view of applicants' amendment to the claims, the rejection of claims 14-20,33-37, 39-46, and under 35 U.S.C. 103, as stated in the above indicated Office Action, has been withdrawn.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

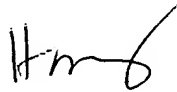
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The

Art Unit: 2812

examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt, can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



HN

01-19-06

Ha Nguyen
Primary Examiner